RESEARCH HIGHLIGHTS

Technical Series 01-119

THE BREEAM GREEN LEAF ENVIRONMENTAL ASSESSMENT PROTOCOL FOR MULTI-RESIDENTIAL BUILDINGS

Introduction

BREEAM Green Leaf is an environmental assessment protocol that was developed in response to the need in the marketplace for a less expensive methodology that could be partially conducted in-house. This makes it an appropriate introductory whole-building, comprehensive energy and environmental assessment for managers of multi-residential buildings. The methodology originated in Canada and was developed by ECD Energy, Environment Canada and Terra Choice. It combined the BREEAM set of environmental issues with the Green Leaf Eco-Rating procedure.

In its scope, BREEAM Green Leaf covers issues similar to the CMHC's *Five Essentials of Healthy Housing*[1], namely Energy Efficiency, Resource Efficiency, Environmental Responsibility, Occupant Health and Affordability. In addition, BREEAM Green Leaf addresses operation and management issues. Some elements of the *Five Essentials*, such as better use of the site to increase occupant density, flexible design to reduce future renovation costs, and use of recyclable materials, are covered in greater detail in the *BREEAM Green Leaf for New Buildings*, which has been developed for projects at the design stage.

Overview of the Pilot Assessments

Six large property management firms were approached with the offer of subsidized assessments, in exchange for which they would participate in a feedback survey. The sample represented a wide range of the multi-residential building types, age and size and ranged from inner city housing to city and suburban locations.

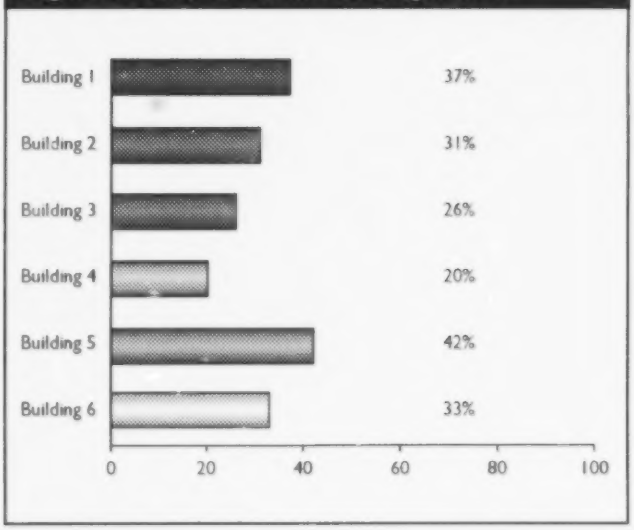
Method of Assessment

The assessment is based on an investigation of building performance and management practices by use of a checklist and walk-through survey. The data is then used to generate a report, which provides a building rating and a list of recommendations to improve the building and management performance. The assessment addresses the following environmental performance issues:

Environmental Management

- *Environmental Management System*
  Strategic planning, performance targets, prioritization, training sessions, programs, regulatory compliance, continual improvement
- *Purchasing Policy*
  Environmental purchasing, contract procurement and energy-efficient equipment
- *Emergency Response*
  Risk assessment and emergency response procedures to chemical spills, asbestos, accidental CFC release

Figure 1—Environmental Management



[1] http://www.cmhc-schl.gc.ca/schl.html/

Energy and Water Efficiency

- *Building Energy Efficiency*
  Energy performance targets, demand reduction, building envelope, air sealing and energy-efficiency features
- *Energy Management*
  Energy policy, audits, monitoring and targets, budgeting, metering and preventive maintenance
- *Transportation*
  Access to public transit and provision for alternative modes of transport
- *Water Efficiency*
  Water performance targets, water-saving features, metering, leak-detection systems, landscape irrigation, water-cooling towers

Figure 2—Water Efficiency

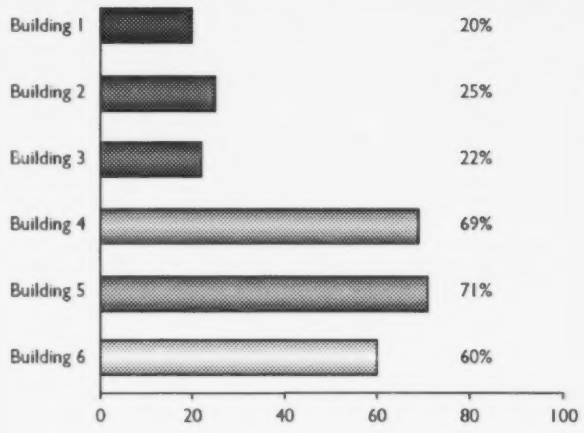
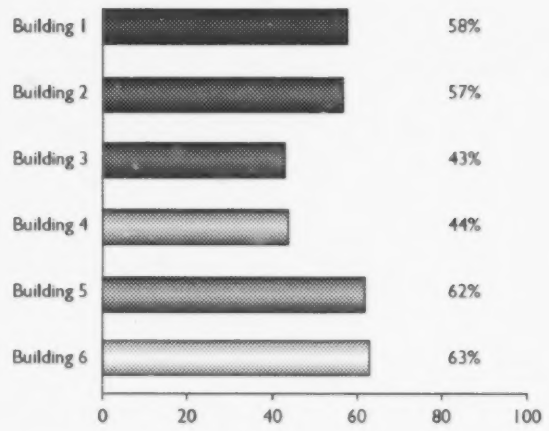


Figure 3—Energy Efficiency



Resources

- *Waste Reduction and Recycling*
  Waste handling and recycling facilities for recyclables, composting, waste reduction programs, reuse of building materials in construction or demolition, and reduce, reuse, recycle programs
- *Site*
  Environmental site assessments, remediation and ecological enhancement

Figure 4—Resources

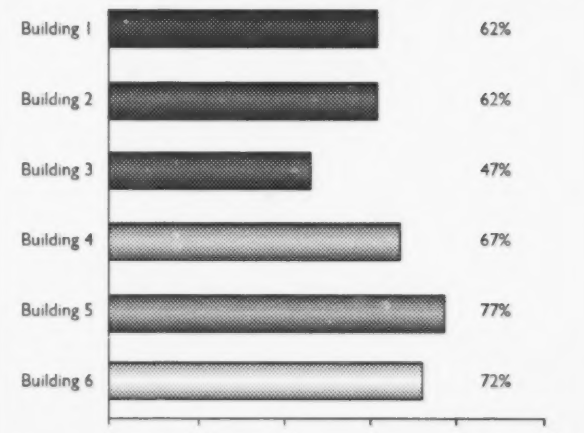


Figure 5—Emissions, Effluents and Other Environmental Impacts

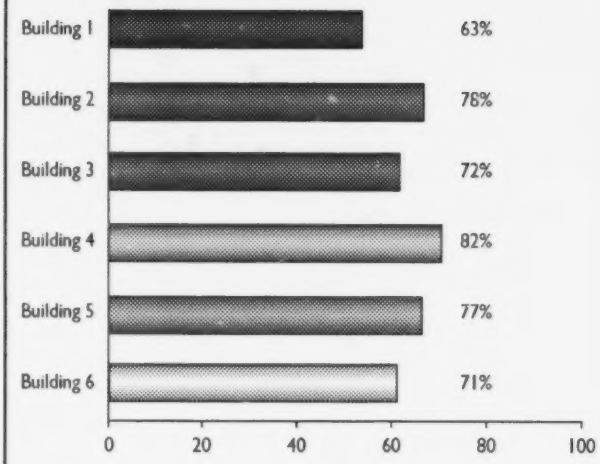
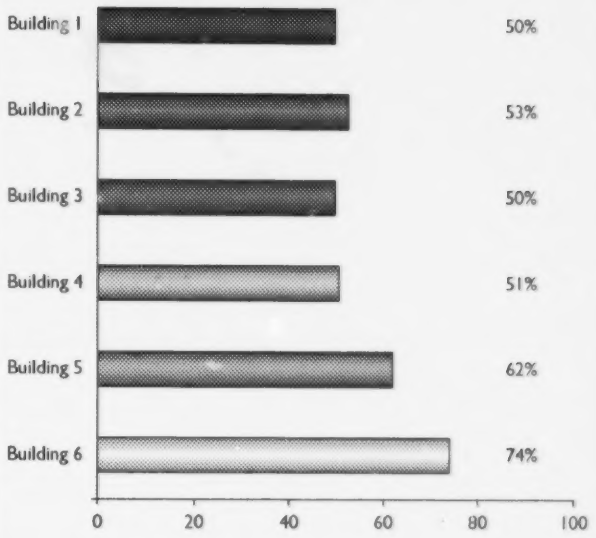


Figure 6—Indoor Environment



Emissions, Effluents and Other Environmental Impacts

- *Air Emissions*
  NOx emissions, boiler control, monitoring and upgrades, analysis of flue gases, low sulphur content of fuel, boiler upgrades
- *Ozone Depletion*
  Phase-out plans for ozone-depleting refrigerants, leak detection and recovery, refrigerant inventories, refrigerant storage
- *Water Effluents*
  Floor drains protection, roof drains disconnected from sanitary or combined sewers, non-toxic cleaning supplies, landscaping practices, minimization of glycol loss
- *Microbial Contamination*
  Maintenance schedules for wet cooling towers, drift eliminator(s), stratification of hot water tanks, deadlegs in hot water system, point-of-use heaters
- *Hazardous Materials*
  Asbestos, lead pipes, radon, PCBs, storage tanks, hazardous materials storage and containment, pesticides, MSDS sheets, WHMIS labels, education/training

Indoor Environment

- *Lighting*
  Use of electronic ballasts, shading and blinds, cleaning of light fixtures
- *Ventilation*
  Location of air intakes, CO^2 concentrations, corridor make-up air, standing water in condensate drip trays, corrosion in AHU, clean ducts, percentage of fresh air in HVAC, openable windows, cross-ventilation, occupant's HVAC controls and maintenance
- *Filtration*
  Filter efficiency, fitted manometers for replacement schedules and ease of access to filters
- *IAQ profile*
  Source control, mold, chemical storage areas, complaint response procedures
- *Parking, Shipping and Receiving*
  Ventilation of parking areas, street level air-intake monitoring for CO
- *Renovation, Decorating and Remodeling*
  Renovation procedures include IAQ concerns.
- *Smoking*
  Designated smoking areas

Dwelling Unit Criteria

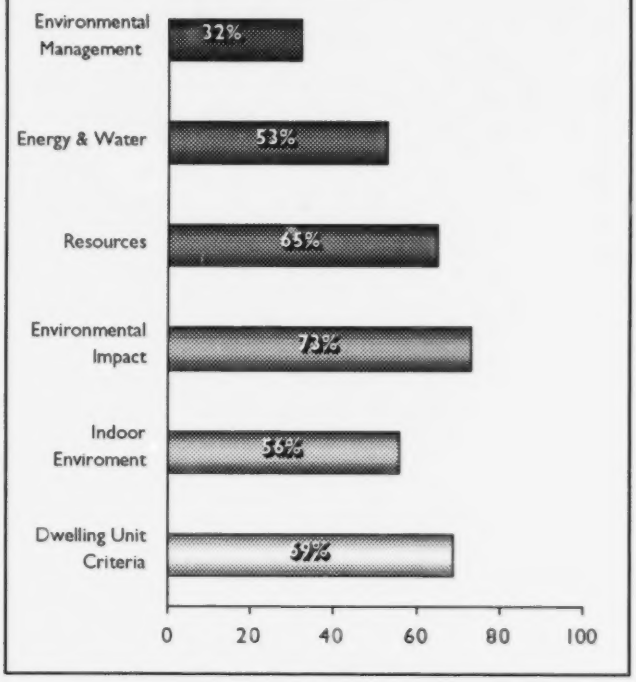
- *Safety and Location*
  Safety of the neighbourhood, building security, distance to shopping, schools, places of worship, parks etc., common facilities in the building.
- *Environmental Controls*
  Thermal comfort, relative humidity
- *Daylighting and Views*
  Views, overshadowing
- *Acoustics*
  Noise separation
- *Household Information Kit*
  Access to environmental information
- *Dwelling IAQ*
  Mold, off-gassing, VOC, carpeting
- *Accessibility*
  Accessibility conditions

Findings Pilot Assessment

The following charts represent the average performance ratings of the six buildings in the pilot. The ratings help to immediately identify the areas needing attention. In building portfolios it can identify a systematic problem across the portfolio or a problem specific to an individual building. The rating is an excellent way to communicate to the top management where to focus resources.

The participants received a report for each of the individual buildings with practical recommendations on how to improve the performance of their buildings with respect to the issues outlined above. Some of the recommendations concerned management issues, for example, the need to document procedures, schedules, resources and responsibilities as well as training needs. This is important, especially in facilities with moderate to high management turnover rates. Some recommendations concerned priorities for future retrofitting, for example air sealing. The reports can serve as a guide for the participants on how to structure and prioritize an action plan for dealing with energy and environmental issues.

Figure 7—Average Performance Rating



Results of Participants Survey

One of the objectives of the pilot project was to gauge the perceived importance of building environmental issues for owners, managers and tenants, and to evaluate the perceived value and effectiveness of the assessment. Two surveys were conducted—a pre-assessment survey, and a post-assessment survey.

Results of the survey indicate that...

The assessment produced a notable shift of perception regarding:

- *The environmental impact of buildings*
  In the pre-assessment survey, the majority of responses indicated a perception that buildings had "negligible" or "not very significant" impact on the environment. In the post-assessment survey, the greater majority of responses to the same question ranged from "the impacts of buildings were somewhat significant" to "the impacts of building were extremely significant."
- *The value of environmental assessments*
  82 per cent of respondents indicated that the value of the report exceeded their expectations.
- *The potential of property managers to influence tenants*
  In the pre-assessment survey, all of the respondents indicated that they felt they had no potential to influence the tenants to conserve energy. In the post-assessment survey, 66 per cent of respondents had changed their positions and said they could have some influence if they tried.
- *Building managers are driven by "bottom line considerations"*
  The value of the assessment lies in indicating areas where operational savings can be achieved. Budgeting and reserve fund maintenance decisions are made much easier.
- *Building managers are interested in having an overview of their building*
  They favor a rating/labelling system because it allows them to make more informed, effective and accurate comparisons of their buildings to others.

Implications for the Canadian Housing Industry

- *Building operators are interested in comparing their buildings to others*
  Putting the results of all assessments (without identifying the buildings) on the Web would allow property managers and owners to compare the performance of their building to a benchmark.
- *A comprehensive environmental assessment protocol is relevant to management goals*
  By linking the environment with the bottom line, it raises awareness that the majority of "green" practices for buildings are not only good for the environment but also contribute to improved efficiencies, operational savings, and tenant comfort and satisfaction. By synthesizing the best practices that are relevant to the majority of buildings by means of a simple checklist that can be completed in half a day, this makes it an affordable tool that can be used in-house or with minimal help of a consultant.
- *The assessment constitutes a hands-on awareness raising and practical learning experience* for participants on energy, environmental impact and indoor environment.
- *For large portfolios, is a suitable tool for doing a portfolio-wide review*
  A portfolio-wide review is often more acceptable than isolated building audits, because senior management tends to take the strategic view that collecting, compiling and summarizing operating expense information about a portfolio of properties can lead to better decision-making. By elevating energy and environmental management to a strategic initiative, there is an increased likelihood of obtaining senior management buy-in.
- *Used for an overall portfolio review, it provides numerous recommendations for effective maintenance measures, many of which can be done in-house*
  A number of these may apply to a large portion of portfolios. These should be communicated as soon as possible, following the portfolio review.
- *Used as an overall portfolio-wide review, it gives strong indications where retrofit dollars would be best spent*
  These are the buildings that are most in need of an energy audit. Where dollars are scarce, the portfolio review can also help determine which buildings would benefit most from a full energy audit and which ones would suffice to have an audit to one or two systems.
- *It can be used as a benchmark for society*
  The potential for benchmarking that the assessment offers is useful not only to owner/property managers who want to know how they are doing in relationship to others; it also can be used a as benchmark for society, as an indication of how well society is responding to environmental pollution.
- *The building assessment experience clearly resulted in increased awareness of environmental issues by property managers and building operators.*
  This was true despite the fact that due to time constraints, no explicit efforts were made during the assessment to impart

background information, other than the minimum needed to fill in the questionnaire. This indicates that there is a high degree of receptiveness and/or that the assessment itself constitutes a learning experience.

- *Building operators need to be clearly informed that the assessment is* not intended to replace specialized audits such as energy, water, hazardous materials, but provides an overview that highlights building's strengths and red-flags areas of concern.
- *Resources are the deciding factor when addressing environmental issues.*
  Building operators see value in the assessment if it can provide recommendations to achieve operational savings.

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Housing Research at CMHC

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